jc685 U.S. PTO
12/27/99

PATENT

Docket No. BC9-99-046 (1963-7353)

Express Mail Label No. _____

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

jc511 U.S. PTO
09/472602
12/27/99

UTILITY APPLICATION AND APPLICATION FEE TRANSMITTAL (1.53(b))

ASSISTANT COMMISSIONER FOR PATENTS
Box Patent Application
Washington, D.C. 20231

Sir:

Transmitted herewith for filing is the patent application of

All Inventor(s)

David J. Allard

James M. Dunn

For: BROADBAND MULTI-SERVICE PROXY SERVER SYSTEM AND METHOD OF OPERATION FOR INTERNET SERVICES OF USER'S CHOICE

Enclosed are:

[X] 13 page(s) of specification, 2 page(s) of Abstract, 5 page(s) of claims

[X] 7 sheets of drawing [x] formal [ ] informal

[ ] _____ page(s) of Declaration and Power of Attorney

[ ] Unsigned
[ ] Newly Executed
[ ] Copy from prior application

[ ] Deletion of inventors including Signed Statement under 37 C.F.R. § 1.63(d)(2)

[ ] Incorporation by Reference: The entire disclosure of the prior application, from which a copy of the combined declaration and power of attorney is supplied herein, is considered as being part of the disclosure of the accompanying application and is incorporated herein by reference.

[ ] Microfiche Computer Program (Appendix)

[ ] ____ page(s) of Sequence Listing

[ ] computer readable disk containing Sequence Listing

[ ] Statement under 37 C.F.R. § 1.821(f) that computer and paper copies of the Sequence Listing are the same

[ ] Assignment Papers (assignment cover sheet and assignment documents)

[ ] Charge Fee(s) $40.00 for recording the Assignment to Deposit Account No. 09-0452 Order No. . A DUPLICATE COPY OF THIS SHEET IS ATTACHED

[ ] Assignment papers filed in parent application Serial No. _____.

[ ] Certification of chain of title pursuant to 37 C.F.R. § 3.73(b).

[ ] Foreign priority is claimed under 35 U.S.C. § 119 from _____ Patent Application(s) No. _____ dated _____ .

[ ] Priority document(s) will be submitted at a later date.

[ ] Priority document(s) is/are submitted herewith.

[ ] Information Disclosure Statement

[ ] Copy of ___ cited references

[ ] Preliminary Amendment

[X] Return receipt postcard (MPEP 503)

[ ] This is a [ ] continuation [ ] divisional [ ] continuation-in-part (C-I-P) of prior application serial no. _____.

[ ] Cancel in this application original claims _____ of the parent application before calculating the filing fee. (At least one original independent claim must be retained for filing purposes.)

[ ] A preliminary Amendment is enclosed. (Claims added by this Amendment have been properly numbered consecutively beginning with the number following the highest numbered original claim in the prior application.

[ ] The status of the parent application is as follows:

[ ] A Petition For Extension of Time and a Fee therefor has been or is being filed in the parent application to extend the term for action in the parent application until _____.

[ ] A copy of the Petition for Extension of Time in the co-pending parent application is attached.

[ ] No Petition For Extension of Time and Fee therefor are necessary in the co-pending parent application.

[ ] Please abandon the parent application at a time while the parent application is pending or at a time when the petition for extension of time in that application is granted and while this application is pending has been granted a filing date, so as to make this application co-pending.

[ ] Transfer the drawing(s) from the patent application to this application.

[ ] Amend the specification by inserting before the first line the sentence:
This is a [ ] continuation [ ] divisional [ ] continuation-in-part of co-pending application Serial No._____ filed _____.

I. CALCULATION OF APPLICATION FEE

	Number Filed		Number Extra		Rate	Basic Fee $760.00
Total Claims	20	-20=	1	x	$18.00	$0.00
Independent Claims	3	- 3=	0	x	$78.00	$0.00
Multiple Dependent Claims	[ ] yes		Additional Fee	=	$260.00	$0.00
	[x] no		Additional Fee	=	NONE	
					TOTAL	$760.00

[ ] A statement claiming small entity status is attached or has been filed in the above-identified parent application and its benefit under 37 C.F.R. § 1.28(a) is hereby claimed. Reduced fees under 37 C.F.R. § 1.9(F) (50% of total) paid herewith $ _____.

[ ] A check in the amount of $ _____ in payment of the application filing fees is attached.

[ ] Charge Fee(s) to Deposit Account No. 09-0452 Order No. . A DUPLICATE COPY OF THIS SHEET IS ATTACHED.

[X] Fees will be paid when Declaration & Power of Attorney is filed with response to missing parts.

[ ] The Assistant Commissioner is hereby authorized to charge any additional fees which may be required for filing this application, or credit any overpayment to Deposit Account No. 12-2325. A DUPLICATE COPY OF THIS SHEET IS ATTACHED.

Respectfully submitted,

MORGAN & FINNEGAN, L.L.P.

Dated: December 27, 1999

By: _____

Joseph C. Redmond, Jr., Registration No. 18,753
(202) 857-7887 Telephone
(202) 857-7929 Facsimile

CORRESPONDENCE ADDRESS:

MORGAN & FINNEGAN, L.L.P.
345 Park Avenue
New York, New York 10154

BROADBAND MULTI-SERVICE PROXY SERVER SYSTEM AND METHOD OF OPERATION FOR INTERNET SERVICES OF USER'S CHOICE

Inventors: David J. Allard and James M. Dunn

BACKGROUND OF THE INVENTION

1) FIELD OF INVENTION

This invention relates to a communication systems and methods of operation. More particularly, the invention relates to a broadband multi-service proxy server in a communication system and method of operation for Internet services of user's choice.

2) BACKGROUND DISCUSSION

In today's Internet environment, individual users may choose any initial Internet Service Provider (ISP) they wish. The ISP provides the user a dial-in number and a log on script that contains the user-id and oftentimes a password. In a typical scenario, when the user dials in, an authentication server answers the call (dial modem), and if the ID is authenticated, assigns the user to an Internet address from a local pool of addresses. From this point on, the user is connected to the Internet through the dedicated dial line and the ISP's router.

In a broadband IP-based network, however, where multiple users share a common connection line, there is currently no way to attach a group of users to their individual choices of an ISP. A user may send a connection request to their ISP, and to their authentication server, but since the network authentication server has not yet assigned the user's IP address to them, there is no way for the return message to be routed back to the user. For this reason, cable company

customers must purchase their ISP functions from the cable company affiliated ISP, since the authentication process must know to whom to assign an IP address.

What is needed in the art is a system and method of operation for broadband customers in a communication system to connect to an ISP of their choice for Internet services and not be attached to an ISP affiliated with a broadband network, e.g. a cable network for Internet services.

Prior art related to servicing broad band customers in another network includes:

USP 5, 949, 779 issued September 7, 1999, filed May 8, 1997 discloses a system for providing remote access and control of electronic devices connected to a consumer electronic bus (CEB). A proxy node is provided on a CEB bus wherein the proxy node is also linked to a master node via a broad band access network. The remotely located master node may communicate with one or more devices located on a CEB bus by transmitting messages to the proxy node over the broad band area network. The proxy node converts messages from a ATM protocol compatible with transmissions over the broad band area network to a CEB bus network protocol and then forwards the messages to recipient devices over the CE bus network. In the opposite direction, a device on a CE bus network may communicate with a remotely located master node by transmitting CE bus – standard messages to the respective proxy nodes over the CE bus network. The proxy node packatizes the messages into an ATM transmission format and forwards the messages to the master node over the broad band area network.

The prior art fails to disclose a broadband communication system which enables users to connect to the Internet using an Internet Service Provider of their choice.

SUMMARY OF THE INVENTION

An object of the invention is a system and method of operation enabling customers of broadband networks to receive Internet service from providers of their choice.

Another object is a broadband multiservice proxy server and method of operation, which allow broadband network customers to obtain Internet service from Internet service providers of their choice.

Another object is a broadband multi-server proxy server and method of operation in an Internet environment using a message format which enables broadband customers to select an ISP of their choice for services available from the Internet.

These and other objects, features and advantages are achieved in a broadband multi-server proxy server and method of operation using an extended DHCP message format which enables broadband customers, typically cable network customer, to select an ISP of their choice for services available from the Internet. A broadband network includes a multi channel cable coupled at one end to a plurality of customers and a home network serving several stations within a location. The network is coupled at the other end to head end equipment providing cable services to the cable customers. Each customer is assigned a Medium Access Control (MAC) address on the network. The head end equipment is linked to a modem management system and a router. A Broadband Multi-service Proxy Server (BMPS) having a database containg customer service information is coupled to the router. The MAC addresses of the cable customers are stored in the database. An Internet Service Provider network is coupled to the router and serves a plurality of Internet Service Providers (ISP), each ISP being linked to the Internet. In operation, the cable customers register with the ISPs of their choice. The ISPs send the customers a customer ID, password, a log on script and updates its database and the database of the BMPS with the customer information. The BMPS authorizes the customer modem and

router for access to the ISP. As part of a customer's logon request, the MAC address is attached to identify the origination point of the request. The logon script sends the logon request in an extended DHCP message to the ISP via the BMPS for an Internet address. The BMPS checks the logon request against the database to verify a legitimate customer and obtains the customer profile for management and billing purposes. The BMPS sends the logon request to the requested ISP using the customer ID, password and the BMPS as the source address for any customer message. The ISP verifies the customer address again its database and updates the router address tables to accept customer messages with the new address. Normal customer ISP traffic begins. Return message to the customer are received by the BMPS which forwards the messages to the customer at there MAC address. When the customer logs off, the ISP expires the customer address, updates the router as necessary and sends a logoff message to the BMPS. The BMPS cancels the customer address, updates the router; the database and billing files as necessary. The broadband multi-service proxy server can remain in the serial path if desired to continuously check on the validity of the packets and also count the packets for billing purposes traversing their link. Alternatively, the broadband multi-service can be removed from the link allowing the packets to flow directly to the router and thence to the Internet through the ISP of their choice.

DESCRIPTION OF THE DRAWINGS

The invention will be further understood from the following detailed description of a preferred embodiment taken in conjunction with an appended drawing, in which:

Fig. 1 is a prior art representation of a broadband network providing broadband customers access to the Internet through an Internet Service Provider (ISP) affiliated with the network.

Fig. 2 is a representation of a broadband network including a Broadband Multi-service Proxy Server (BMPS) providing broadband customers access to the Internet through an ISP of their choice and incorporating the principles of the present invention.

Fig. 3A is a representation of a dynamic host controlled protocol (DHCP) message format used in the system of Fig. 1 enabling customers to access the Internet through an ISP associated with the system.

Fig. 3B is a representation of the additional fields proposed as an extension to the dynamic host controlled protocol (DHCP) message format used in the system of Fig. 2 enabling customers to access the Internet through an ISP of their choice.

Fig. 4 is a representation of typical billing information used in the system of Fig. 2.

Figs. 5 A, B and C are flow diagrams for connecting broadband customers in Fig. 2 to ISPs of their choice.

DESCRIPTION OF PREFERRED EMBODIMENTS

In Fig. 1 a broadband, shared link, multi-user network 10, such as a cable, satellite, radio, LAN/Wan includes a network 11 coupled a plurality of customers 12^1, 12^2... 12^n and an Internet Service Provider (ISP) 14 associated with the network 10. For simplicity, the broadband network 10 will be described in terms of a cable network 11 in which the customers 12^1... 12^n include cable modems 16^1, 16^2.... 16n which link the customers through a broadband cable 18 to a cable affiliated ISP server 20. Typically, the cable modems use an Ethernet protocol for the computers 13^1, 13^2 and 13^n. The modems look like any LAN network to the computer. The computers use a frequency shift to put an Internet protocol into a given channel assignment on the cable 18. Typically, the modems $16'$, 16^1 share the last mile of the cable to the server 20. As

a result, the server cannot send responses back to the cable or broadband customers based on an individual line or port connection point as in the case of a dial-in modem connection to the Internet. In the latter case, an ISP attaches the user to an authentication server, typically a Remote Authentication Dial in User Services (RADIUS) server which is a software-based security authentication protocol developed by the International Engineering Task force (IETF) RADIUS Working Group and available from a number of suppliers including Microsoft, Redmond, Washington. RADIUS provides access to all Internet services using one username and password. If the authentication is correct, the customer is assigned a temporary IP address from the ISP's pool of available addresses using a protocol called Dynamic Host connection Protocol (DHCP). DHCP provides a mechanism through which computers using Transaction Control Protocol/Internet Protocol (TCP/IP) can obtain protocol configuration parameters automatically through the network. The most important configuration parameter is an IP address carried by DHCP and assigned to a computer from a pool of IP addressees managed by DHCP. DHCP is an open standard, developed by the Dynamic Host Configuration working group (DHC WG) of the Internet Engineering Task force (IETF).

In the case of a cable system, however, to route messages to the correct cable modem, a lower level routing mechanism is used. Each cable modem is assigned a unique Medium Access Control (MAC) address on a shared cable. The communication protocol beneath the Internet protocol layer handles the MAC addresses. The MAC addressing maps out the physical network at the LAN adapted card level. IP addressing maps out the logically connected machine at the host level. An inter office LAN with an occasional Internet use would have continuously assigned MAC addresses to its computer. Some computers may occasionally get a Dynamic Host Control Protocol (DHCP) assigned address to use with a connection. Unique MAC

addresses are typically embedded by the manufacturer into the ROM of the LAN network interface card and are not associated with RADIUS server authentication or ISP address assignment Continuing in Fig. 1, the cable network 11 is coupled to head end equipment 19 providing the customer with cable services as recorded by a modem management system 20 and to the cable affiliated ISP server 14. Included in the ISP are a router 21 linked to the Internet 28. The router is further linked to a RADIUS server 25; a web server 26 and a mail server 27 for accessing the Internet 28.

In operation, a cable customer sends a DHCP message 30 shown in Fig. 3A to the ISP 14. The message is a standard DHCP packet which contains a base layer 31 containing a code field 33; hardware type field 34; hardware address length field 36, and the number of message hops 35 implemented by routers and ten (10) stacked layers 32- 1...31-10 superimposed on the base layer. Each stacked layer is 4 bytes wide unless otherwise noted. The first layer 32-1 contains a transaction ID 31 which is a random number assigned by the customer to uniquely identify a reply. The second layer field 32-2 indicates the customer time since bootup and a flag field which indicates the type of message. A bit one in the flag indicates broadcast. Other flag bits may be reserved and set to 0. The third layer 32-3 contains a client IP address which is set to 0.0.0. 0 or the last known non-expired address of the client. The fourth layer 32-4 contains the customer address set by the server if the client IP address was 0.0.0.0. The fifth layer 32-5 contains a server IP address which is set by the server that handles the request. The sixth layer 32-6 contains a router address set by a forwarding router. The seventh layer 32-7 contains a client hardware address set by the client. The eighth layer 32-8 may optionally contain the null terminated host name of the responding server. The ninth layer 32-9 contains a boot file name used by the client in the boot up process when BOOTP is also in use. The tenth layer 32 –10

contains an options row which when used with BOOTP, typically includes a code 99.130.83.99 in the first four bytes to identify the mode that the succeeding data is to be interpreted. This code is followed by tag options as defined in IEFT RFC 2132. These DHCP options may include information on routers, DNS, and other domain information. The message is processed at the head equipment and passed to the RADIUS server, which uses the MAC address of the sending modem as a source address for the customer. Customer messages are processed through the Internet using the web server or the mail server, as the case may be.

Currently, there is no way to enable a group of cable users to choose an ISP not affiliated with the cable company. The customer may send a connection request to their ISP and to the related authentication server, but since the network authentication server is not yet assigned the customer's IP address to them, there is no way for the server return message to be routed back to the customer.

A solution to the problem of enabling broadband customers to select an ISP of their choice is shown in Fig. 2.

In Fig. 2 the broadband network 10' is the same as in Fig. 1, except the ISP server 14 is replaced with a Broadband Multi-service Proxy Server (BMPS) 22 including a database 23. A BMPS is a conventional server programmed according to Figs 5A – 5C, to be described hereinafter. A home network 24 has been added to the cable network 10'as an option to the network. The BMPS is linked to the router 21' for accessing a plurality of Internet Service Providers 40, 41, and 42 via an ISP network 29. Databases 43, 44 and 45 are associated with the ISPs 40, 41, 42, respectively. The ISPs are coupled to the Internet 28'. An extended DHCP message structure 39 shown in Fig. 3B. is used in accessing the ISPs The extended DHCP message structure includes an additional layer 32-11 containing an ISP server name; a layer 32-

12 containing the BMPS name, and a layer 32-13 containing the customer or end user ID and password.

Returning to Fig. 2, prior to sign on the customer contacts an ISP(s) for Internet service and is provided with a user ID, password and logon script. The customer information is recorded in a database(s) 40, 41,43, as the case maybe. Upon sign on the customer authentication function is accomplished in a cooperative manner between different servers, the BMPS and the selected ISP server. The BMPS processes the initial customer DHCP logon request. The request may or may not have a server or client IP address identified per the standard Internet DHCP process. The underlying protocol can be whatever protocol is supported by the cable modem. As part of the logon message, the MAC address is attached to identify the origination point of the message. This MAC address is placed in the client hardware address field, Fig. 3a 32-7, of the DHCP package. The BMPS checks the modem MAC address against the modem management system to verify the customer is legitimate and then obtains and records the customer profile for management and billing purpose in the database 23'. The server 21 sends the logon request to the selected ISP on behalf of the customer using the DHCP message 30 and the extended DHCP message 39 (See Figs. 3A and 3B) including the customer or end user ID and password or another unique identifier. The ISP server checks the ID and password in the associated database 40, 41, 42, as the case maybe, for authentication and if legitimate proceeds as normal returning an IP address assignment to the source address i.e., the server 22 using the DHCP message formats 30 and 39. The server 22 updates the database 23 and routing table in router 21' so as to allow future customer messages with the authenticated address to traverse the links authorized to the selected ISP. The customer updates his address mechanism with a valid IP address for IP usage. Future IP packets flow from the customer to the router 21' then to the selected ISP which

forwards the message to the message destination. Return packets from the message receiver reverse the route to the customer. The server 22 can remain in the serial path if desired to continue to check on the validity of the packet and count the packets for billing purposes traversing the links or the server 22 can be removed from the link allowing the packets to flow directly to the router, as described.

When the Internet session is over, the selected ISP sends the BMPS 22 a sign out message for the assigned address that was used. Thereafter, the BMPS 22 will remove that source address of the valid source or destination address in the router table.

Since the customer is serviced by both the cable company and the ISP, billing information and customer care information needs to be collected for both parties. Some collected information may be solely pertinent to the cable supplier. Other information may be solely pertinent to the ISP. Still other information may be common to both the cable company and the ISP. Figure 4, show typical information which may be collected and stored in the modem management system. The information common to the ISP and broadband carrier includes User Name; User Address; User ID; User Password and ISP name. Information variable per session includes Transaction ID; Start/Stop times; Packet count; Bandwidth allocated and special service charges. Information special to the broadband carrier includes Client Address; and Broadband carrier billing data including a pointer to billing detail and special service charges.

Now turning to Figs 5A, B and C, the system in Fig. 2 will be described in terms of a process 500 enabling broadband customers to access the Internet through one or more ISPs of their choice, as follows:

In Figure 5A the process 500 is entered in block 501 in which a customer or end user signs up for ISP service typically by means other than the network, for example, mail, phone,

card, etc. In block 503 the ISP(s) sends the customer a logon program with the ISP's IP address, logon script and a customer ID and password. In block 505 the ISP sends the BMSP server a database update message containing the user name, user ID, password and any other details required to uniquely identify the user to both the ISP and the BMPS. A test is performed by the BMPS in block 507 to determine if the customer is a current broad band customer. A "no" condition initiates an error message in block 509 in which the BMPS server responds to the ISP with an unknown user error message after which the process returns to block 501.

A "yes" condition for the test 507 transfers the process to the block 511 in which the BMPS updates the database 23 with the information and maps the data to a physical broad based modem sending or source address such as the modem MAC address. Thereafter in block 513 the BMPS authorizes the customer modem and router for access to the ISP for DHCP messages or other services indicated in the user profile. The BMPS sends the authorization message to the ISP host in block 515 after which the customer is ready to access the internet through the ISP of his/her choice.

In Figure 5B the customer powers on in block 517 and selects an access logon script to the selected ISP. In block 519 the customer sends an extended DHCP request (Figs 3A and 3B) through the broad band modem onto the cable network 11'. The BMPS receives the customer DHCP request block 521. The BMPS checks the database for the customer profile in block 523. A test is conducted in block 525 to determine if the customer is a legitimate broad band customer. A "no" condition initiates a temporary assignment of an IP address using the DHCP response in block 527. The BMPS sends the customer an unknown user error message in block 529 and revokes the temporary IP address in block 531 after which the process returns to start.

A "yes" condition for the test 525 stores the customer ID and password in its database in block 533. In block 535 the BMPS sends the selected ISP the extended DHCP message with user ID and password and using the BMPS server as the source address. In block 537 the ISP receives the extended DHCP message; checks its database for the customer ID and password in the network 11' and BMPS 22.

In block 539, the ISP conducts a test to determine if the DHCP request on message is from a legitimate customer.

Turning to Figure 5C, a "no" condition for the test 539 nullifies the DHCP request message and in block 541 the ISP does not assign an IP address to user but notifies the BMPS of an intrusion attempt. The ISP terminates processing the DHCP logon request in block 543 and transfers to a waiting state.

In block 545 the BMPS follows its local security practices with respect to intrusions and the process ends.

A "yes" condition for the test 539 initiates block 547 in which the ISP sends an extended DHCP response with the customers assigned IP address to the BMPS. The ISP updates the router tables in block 549 which allows the customer to use the IP address. The BMPS maps the assigned IP address to the appropriate outstanding customer request in block 551. In block 553 the BMPS emulates the ISP and sends a standard DHCP reply to the customer and then updates the network router to allow the new address. The customer updates its address book in block 555 to include the assigned IP address in the address field of messages. With the IP address the customer conducts normal ISP traffic in block 557. A test is performed in block 559 to determine if the session with the ISP is ended. A "no" condition returns the process to block 557. A "yes" condition for the test 559 initiates block 561 in which the customer logs off using

normal log off procedures. In block 563 the ISP allows the customers ISP address to expire; updates its router tables and sends a log off message to the BMPS. The BMPS cancels the customer address in blocks 565 and updates its routers; database and billing files as necessary after which the process ends.

While the invention has been shown and described in conjunction with the preferred embodiment, various changes can be made without departing from the spirit and scope of the invention as defined in the appended claims, in which:

We claim:

1. A broadband Internet Protocol (IP) based network, comprising:

at least one customer coupled to the network for receiving IP services;

means for generating a DHCP message in a customer request for IP services with a selected Internet Services Provider (ISP);

server means for receiving the request and DHCP message and generating an extended DHCP request; and

means for receiving and routing the customer request and extended DHCP request to the selected ISP for providing IP services to the customer via the selected ISP

2. The broadband network of Claim1 further comprising:

modem means for coupling the customer to the network; and

means for generating a unique customer address as part of the DHCP request.

3. The broadband network of Claim 1 further comprising:

means coupled to the server means for storing customer address information.

4. The broadband network of Claim 1 further comprising:

means for mapping the unique customer address to DHCP request.

5. The broadband network of Claim 1 further comprising:

routing means coupled to the server and a network serving a plurality of ISP.

6. A broadband multi service proxy server, comprising:

means coupling the server to a broadband IP based network serving a plurality of customers;

means coupling the server to an IP network via at least one Internet Service Providers (ISP) in a plurality of ISPs;

means for generating a customer request including a DHCP message for access to the IP network; and

means for generating an extended DHCP message format in the server enabling a customer to access an ISP of choice for IP network services.

7. The server of Claim 6 further comprising:

means for generating a unique address for a customer and storing the address in the server as an origination source for a customer request.

8. The server of Claim 6 further comprising:

means for pre- registering a customer for IP service with an ISP prior to generating a customer request ;

means for sending the server a customer ID and password for customers registered by the ISP.

9. The server of Claim 6 further comprising:

means for sending a DHCP and unique customer address in a customer request for access to the IP network;

means for receiving the customer request and storing the unique customer address in a database coupled to the server.

10. The server of Claim 6 further comprising:

means for sending the server an extended DHCP response and customer assigned address for customer requests validated by the ISP.

11. The server of Claim 6 further comprising:

server means for mapping validated customer requests to a unique customer address; and

server means emulating the ISP and sending the customer a DHCP response to the customer request.

12. The server of Claim 6 further comprising:

means for validating a customer request for access to the IP network at an ISP of customer choice.

13. In a broadband IP based network including server means coupled to the network and to a plurality of ISPs via a switching means, a method of providing IP services to network customers via ISP of their choice, comprising the steps of:

generating a request by a customer including a DHCP message for IP services from a selected ISP;

sending the request and DHCP message to the server for processing to determine if the customer is approved by the network for receiving IP services;

sending the request and an extended DHCP message for IP service to the selected ISP;

and

returning the extended DHCP message to the server and updating tables in the switching means to provide the customer with IP services directly from the selected ISP.

14. The method of Claim 13 further comprising the step of:

mapping the DHCP message to the customer at a unique network address.

15. The method of Claim 13 further comprising the step of:

emulating the ISP by the server means and sending a DHCP reply to the customer followed by updating the switching means to allow the customer to access the ISP of its choice.

16. The method of Claim 13 further comprising the step of:

checking the extended DHCP message by the ISP to determine if the customer is approved to receive IP services.

17. The method of Claim 13 further comprising the step of:

notifying the server when the ISP determines the customer is not approved to receive IP services.

18. The method of Claim 13 further comprising the step of:

sending the server a customer ID and password for customers registered by the ISP.

19. The method of Claim 13 further comprising the step of:

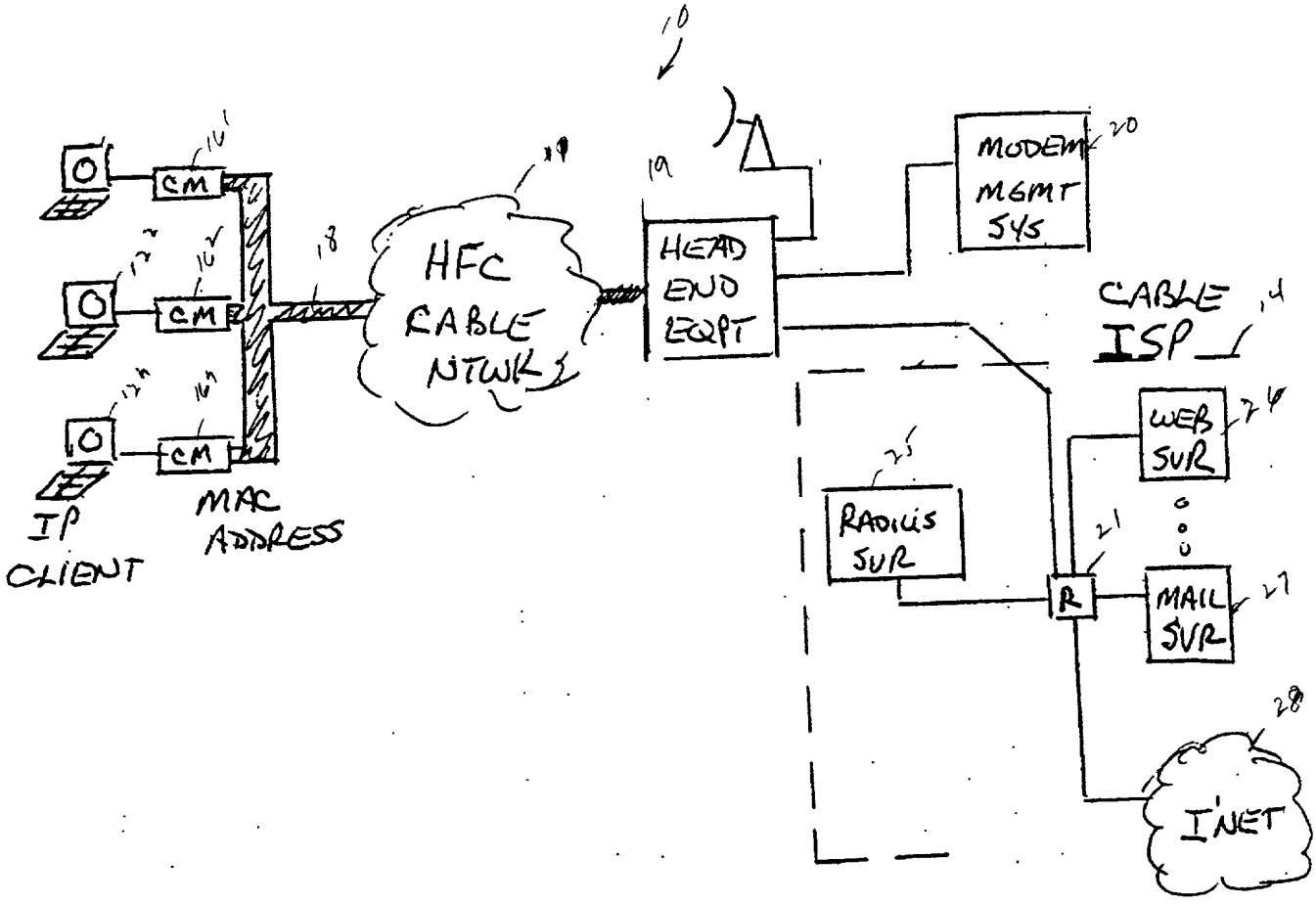
sending the server an extended DHCP response and customer assigned address for customer requests validated by the ISP.

20. The method of Claim 14 wherein the unique customer address is a MAC address.

ABSTRACT

A broadband multi-server proxy server BMPS) and method of operation enables customers to select an ISP of their choice for services available from the Internet. A broadband network includes a multi channel cable coupled at one end to a plurality of customers and a home network serving several stations within a location. The network is coupled at the other end to head end equipment providing cable services to the cable customers. Each customer is assigned a Medium Access Control (MAC) address on the network. The head end equipment is linked to a modem management system and a router. The BMPS has a database containing customer service information and is coupled to the router. The MAC addresses of the cable customers are stored in the database. An Internet Service Provider network is coupled to the router and serves a plurality of Internet Service Providers (ISP), each ISP being linked to the Internet. In operation, the cable customers register with the ISPs of their choice. The ISPs send the customers a customer ID, password, a log on script and updates its database and the database of the BMPS with the customer information. The BMPS authorizes the customer modem and router for access to the ISP. As part of a customer's logon request, the MAC address is attached to identify the origination point of the request. The logon script sends the logon request in an extended DHCP message to the ISP via the BMPS for an Internet address. The BMPS checks the logon request against the database to verify a legitimate customer and obtains the customer profile for management and billing purposes. The BMPS sends the logon request to the requested ISP using the customer ID, password and the BMPS as the source address for any customer message. The ISP verifies the customer address again its database and updates the router address tables to accept customer messages with the new address. Normal customer ISP

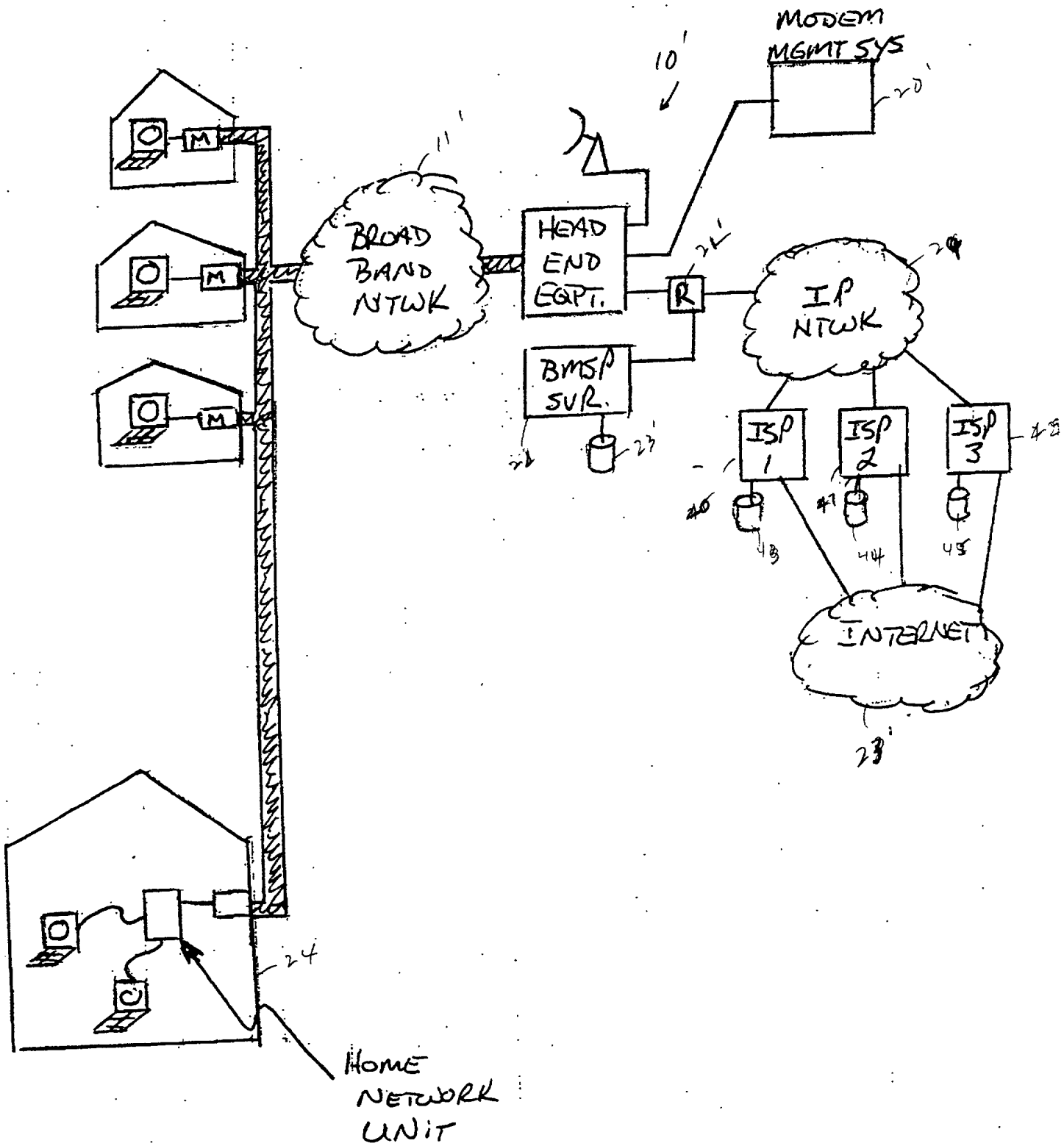
traffic begins. Return message to the customer are received by the BMPS which forwards the messages to the customer at their MAC address.



PRIOR ART

FIG 1

Figure 2


MODEM MGMT SYS
10'
20'
11'
BROAD BAND NTWK
HEAD END EQPT.
R
21'
IP NTWK
BMSP SVR.
ISP 1
ISP 2
ISP 3
INTERNET
24
HOME NETWORK UNIT

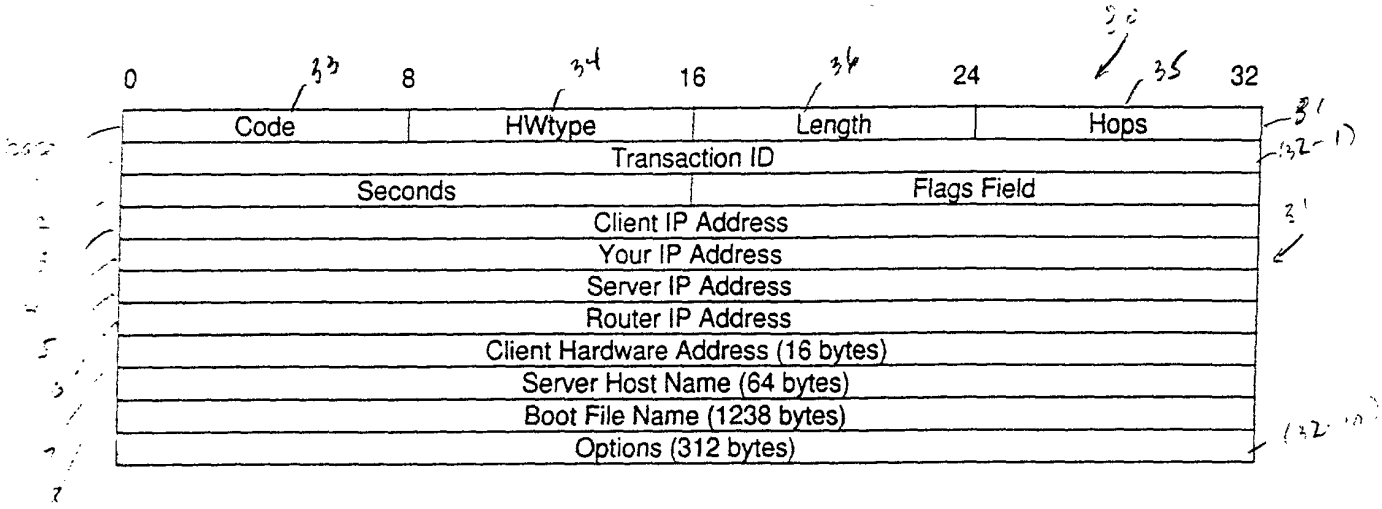

0
8
16
24
32
Code
HWtype
Length
Hops
Transaction ID
Seconds
Flags Field
Client IP Address
Your IP Address
Server IP Address
Router IP Address
Client Hardware Address (16 bytes)
Server Host Name (64 bytes)
Boot File Name (1238 bytes)
Options (312 bytes)

FIG 3A

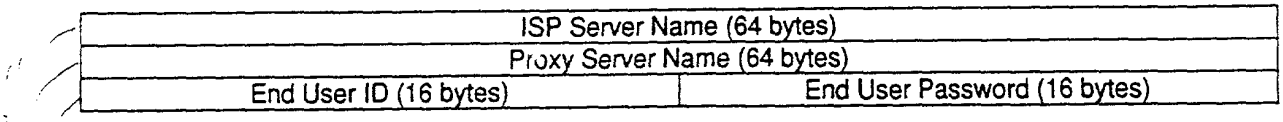

ISP Server Name (64 bytes)
Proxy Server Name (64 bytes)
End User ID (16 bytes)
End User Password (16 bytes)

FIG 3B

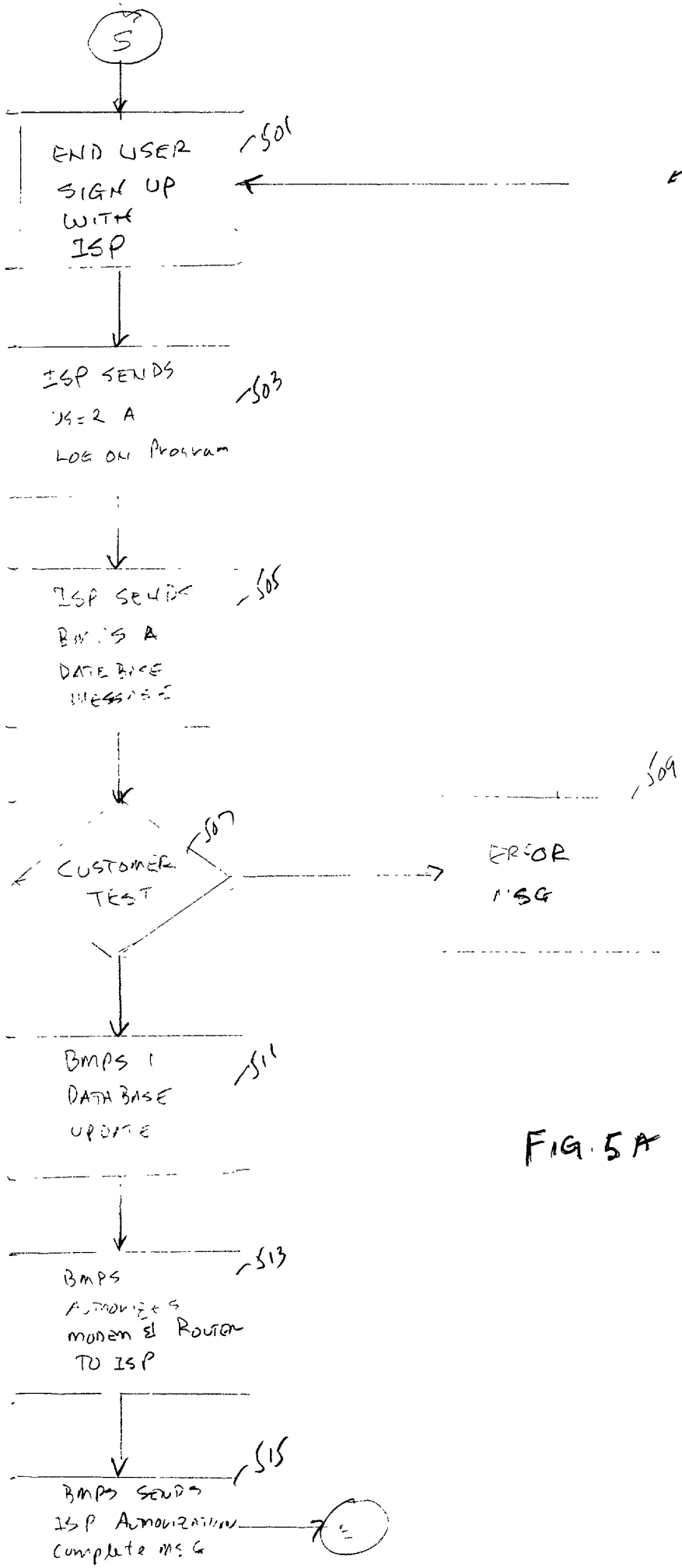

5
END USER SIGN UP WITH ISP
501
500
ISP SENDS USER A LOG ON Program
503
ISP SENDS BMPS A DATABASE UPDATE MESSAGE
505
CUSTOMER TEST
507
ERROR MSG
509
BMPS DATABASE UPDATE
511
BMPS AUTHORIZES MODEM & ROUTER TO ISP
513
BMPS SENDS ISP AUTHORIZATION COMPLETE MSG
515
=

FIG. 5A

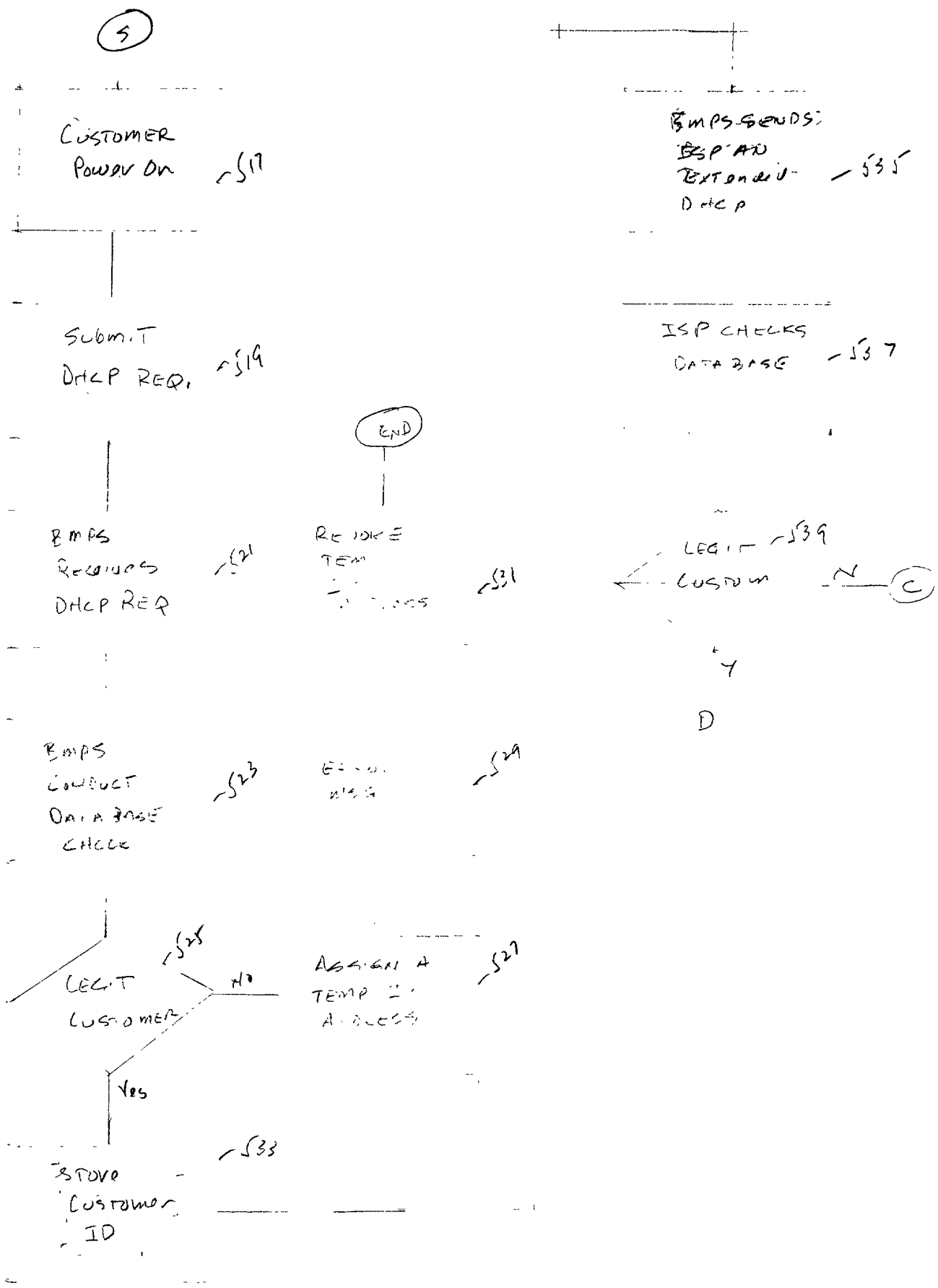

5
CUSTOMER POWER ON
S17
SUBMIT DHCP REQ.
S19
BMPS RECEIVES DHCP REQ
S21
BMPS CONDUCT DATA BASE CHECK
S23
LEGIT CUSTOMER
S25
NO
YES
S33
STORE CUSTOMER ID
ASSIGN A TEMP
S27
END
S31
BMPS SENDS ESP AND EXTENDED DHCP
S35
ISP CHECKS DATA BASE
S37
LEGIT CUSTOMER
S39
C
D

FIG 5B

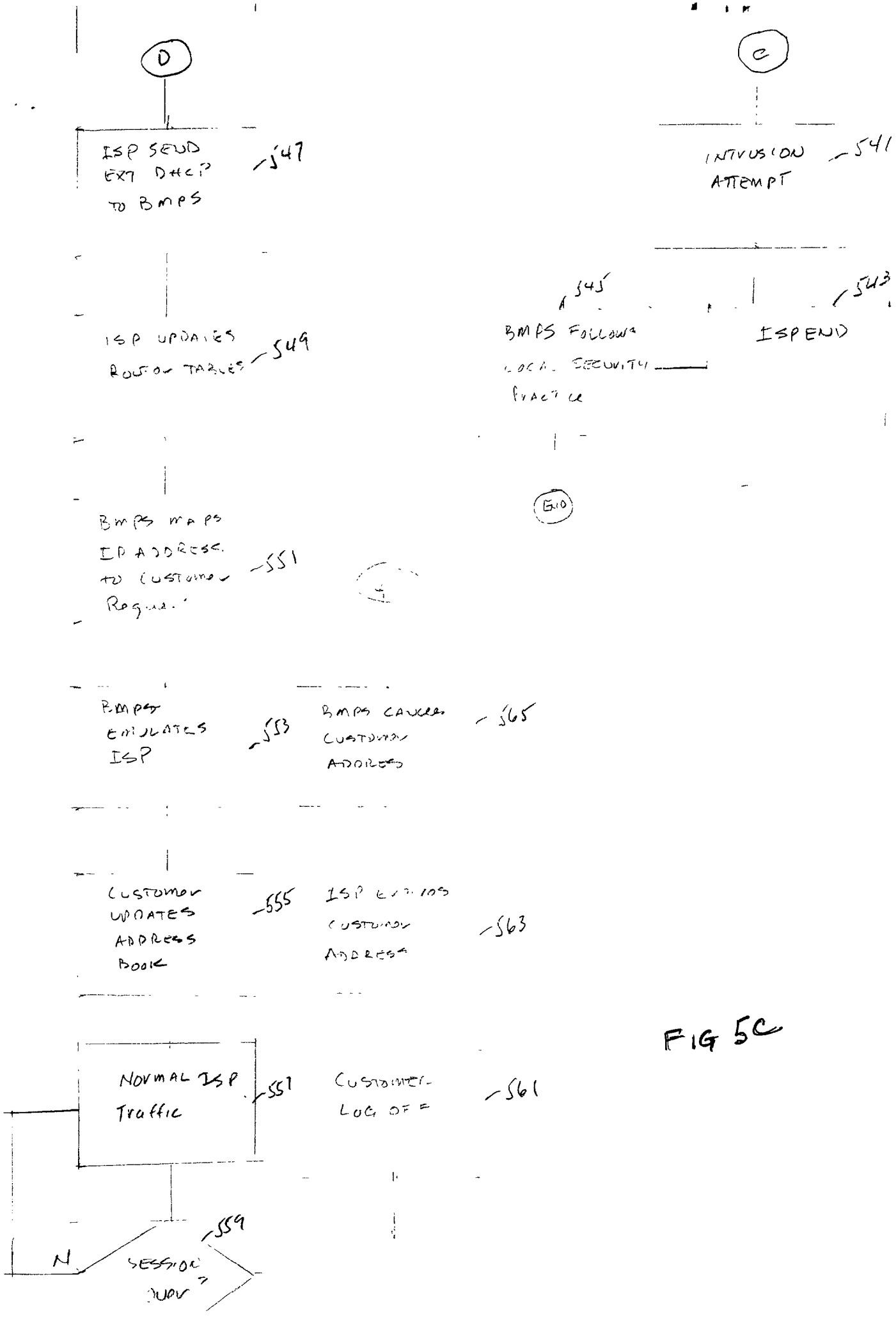

D
ISP SEND EXT DHCP TO BMPS
547
C
INTRUSION ATTEMPT
541
545
543
ISP UPDATES ROUTER TABLES
549
BMPS FOLLOWS LOCAL SECURITY PRACTICE
ISP END
END
BMPS MAPS IP ADDRESS TO CUSTOMER REGIME
551
BMPS EMULATES ISP
553
BMPS CACHES CUSTOMER ADDRESS
565
CUSTOMER UPDATES ADDRESS BOOK
555
ISP EXPIRES CUSTOMER ADDRESS
563
NORMAL ISP TRAFFIC
557
CUSTOMER LOG OFF
561
559
N
SESSION OVER

FIG 5C

FIGURE 4

TYPICAL BILLING INFORMATION

PER USER, PER ISP

* variable per session

Common to ISP & Broadband carrier

- User name
- User address
- User ID
- User Password
- ISP's name
- * Transaction ID (if used)
- * Start / Stop times
- * Packet count (if used)
- * Bandwidth allocated (if used)
- Billing options
  - who bills (broadband carrier or ISP)
  - pointer to billing detail
  - * special service charges, if any

Specific to Broadband Carrier

- Client hardware address
- Broadband carrier billing data
  - pointer to billing detail
  - * special services charges, if any